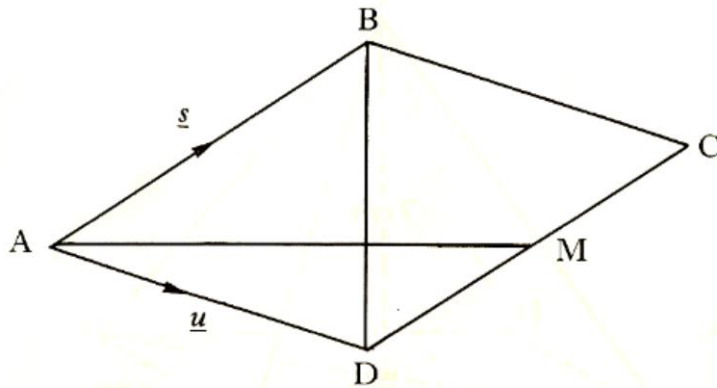


## National 5

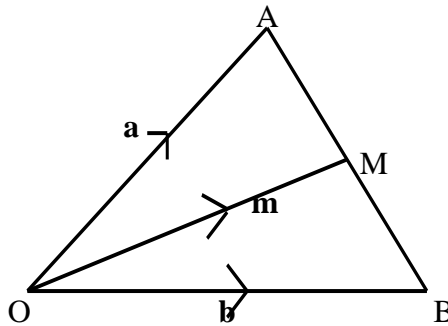
### Homework AP5

1. The diagram below shows a parallelogram ABCD. M is the mid-point of CD and  $\overrightarrow{AD}$  and  $\overrightarrow{AB}$  represent the vectors  $\mathbf{u}$  and  $\mathbf{s}$  respectively.



- (a) Express  $\overrightarrow{AM}$  and  $\overrightarrow{BD}$  in terms of  $\mathbf{u}$  and  $\mathbf{s}$ .
- (b) If  $\mathbf{u} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$  and  $\mathbf{s} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$ , find the components of the vectors represented by  $\overrightarrow{AM}$  and  $\overrightarrow{BD}$ .
- What conclusion can you draw about the straight lines AM and BD?

2. Relative to an origin O, M is the mid-point of the line segment AB. Vectors  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{m}$  represent the directed line segments  $\overrightarrow{OA}$ ,  $\overrightarrow{OB}$  and  $\overrightarrow{OM}$  respectively.



- (a) Show that  $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$
- (b) Show that  $\overrightarrow{OM} = \frac{1}{2} \mathbf{a} + \mathbf{b}$

3.



The perimeter of the rectangle is greater than the perimeter of the triangle.

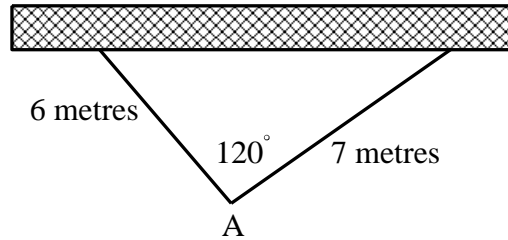
- (a) Form an inequality in  $p$ .
- (b) Solve the inequality to find the values of  $p$  which satisfy the condition stated, where  $p$  is a whole number.

4. Solve these trigonometric equations

(a)  $\cos 2x^\circ = \frac{1}{2}, \quad 0 \leq x \leq 360$

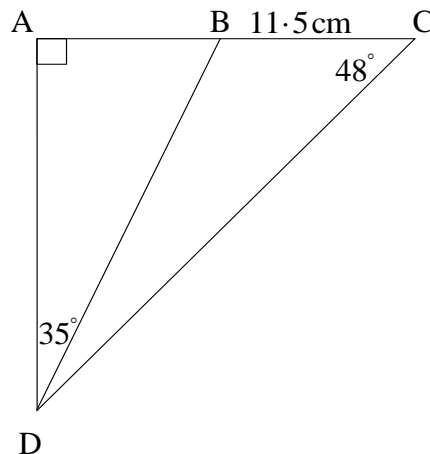
(b)  $\tan^2 x^\circ = 3, \quad 0 \leq x \leq 360$

5. The Addams family wants to fence off a triangular part of their garden for their pet rattlesnake. They have a long straight wall available and two straight pieces of fencing 6 metres and 7 metres in length. They first erect the fencing as shown below.



- (a) Find the area enclosed by the wall and the two pieces of fencing.  
(b) What size should they make angle A to maximise the area of the triangle? Justify your answer.

6. In the diagram below,  $BC = 10.5 \text{ cm}$ .  
Calculate the length of AD.



7. The depth of water in a harbour is given by the formula

$$d = 8 + 3 \sin(30t)^\circ,$$

where  $d$  is the depth in metres, and  $t$  is the number of hours after midnight.

- (a) Write down the maximum depth and the minimum depth.  
(b) Find the depth at 3.15 p.m.  
(c) At what time is the first “low tide” after midnight?  
(d) When is the depth first equal to 6.5 metres?